Space Exploration
Communications & Navigation
Status Panel

Panel Chair: Loren Clare

Jet Propulsion Laboratory

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Agenda

- Introductions
- Top-level status
- Topic briefings by panel members
- Open discussion
Introductions

• Loren Clare (JPL)
  – C3I Lead Engineer, SCIP SE&I
• Jeff Hayden (Consultant)
  – SCIP Architecture SE&I
• Karen Richon (GSFC)
  – SCIP Navigation SE&I
• Mark Flanegan (GSFC)
  – Lead, Cx Lunar Surface Systems Comm & Nav
• Jonathan Gal-Edd (GSFC)
  – SCIP Ground Systems; LAT/LAT2

SCaN: Space Communications & Navigation
SCIP: System Concepts, Integration and Planning
Cx: Constellation (Program)
LSS: Lunar Surface Systems
LAT: Lunar Architecture Team (LAT2: second phase)
SE&I: Systems Engineering & Integration
C3I: Command, Control, Communications & Information

Implement a sustained and affordable human and robotic program to explore the solar system and beyond.

Extend human presence across the solar system, starting with a human return to the Moon by the year 2020, in preparation for human exploration of Mars and other destinations:

- Develop the innovative technologies, knowledge, and infrastructures both to explore and to support decisions about the destinations for human exploration; and
- Promote international and commercial participation in exploration to further U.S. scientific, security, and economic interests.

Addressing the networking concepts, benefits and challenges to meet these requirements
Top-Level Status

- Program schedule dates are unchanged
- Constellation and SCaN are driving to be more internationally compliant
  - Recently changed the protocol stack (next chart) to match CCSDS approach and foster international interoperability
- Constellation architecture remains “netcentric”
Change to C3I Protocol Stack

- Constellation and SCaN agreed to support CCSDS approach to network layer interface

Protocol stack shown in last year’s Panel:

IPv4

Data Link Layer

IPv6

Multiprotocol Interconnect over Frame Relay (RFC 2427)
MnPFR (Frame Relay Framing (ITU-T Q.922)

Space Link Layer

AOS VCA (CCSDS 732.0-B-2)
LDPC FEC (CCSDS 131.1-O-1)
Symbol Randomization (CCSDS 131.0-B-1)
ASM (CCSDS 131.0-B-1)
NRZ-M Symbol Coding (LDPC does not use NRZ-M)

SN Modulations

DG 1 Mode 1 (Spread-Spectrum)
DG 2 (Unspread)
DG 1 Mode 3 (Spread-Spectrum, High Rate Unbalanced)

ENCAP (CCSDS 133.1-B-1)
AOS VCP (CCSDS 732.0-B-2)

IP over CCSDS WG is rekindled and will hold a session at the CCSDS Spring Meeting March 11 to discuss Red Book CCSDS 702.1-R-0 (to lead to Magenta Book).
C3I Stack Status

Change to C3I protocol stack

Protocol stack shown in last year’s Panel:

- Internet Protocol
- Direct Multiplexing
- CCSDS Encapsulation
- Serial Stream

AOS

IPv4, IPv6

Previous C3I approach
Panel member briefings